FULL DRAINAGE REPORT

(FDR)

for

MINE HILL ROAD

345 & 375 Mine Hill Road SW, Issaquah, Washington

NE ¼, Section 33, Township 24 North, Range 6 East, W.M.

04/29/2020

DRS Project No. 14118
City of Issaquah PP18-00003

Owner/Applicant

Ken Lyons
Boardwalk Real Estate
17533 47th Ave NE
Seattle, WA 98155

Report Prepared by

D. R. STRONG Consulting Engineers, Inc.
620 7th Avenue
Kirkland WA 98033
(425) 827-3063

Issue Date: April 29, 2020

DRAINAGE INFORMATION SUMMARY FORM

PROJECT NAME: **MINE HILL ROAD**

PROJECT ENGINEER: **D. R. STRONG CONSULTING ENGINEERS INC.**

PROJECT APPLICANT: **BOARDWALK REAL ESTATE LLC**

PROJECT SITE AREA: **4.898**

PROJECT DEVELOPMENT AREA: **3.061 ACRES**

NUMBER OF LOTS (IF APPLIES): **20**

Summary Table

Drainage Basin Information		
	TDA 1	
On-Site Sub-Basin Area (acres)	3.627	Includes run-on area
Type of Storage Proposed	Detention Vault	
Approx. Live Storage Volume (cu. ft.)	42,135	
Approx. Dead Storage Volume (cu. ft.)	stormfilter	
Soil Type(s) (Natural Resource Conservation Service)	Kitsap Silt Loam	
Pre-developed Runoff Rates		
Q (cfs.) 2 yr.	0.2684	
10 yr.	0.6220	
50 yr.	1.068	
Post-development Runoff Rates (without quantity controls)		
Q (cfs.) 2 yr.	1.0986	
10 yr.	1.6853	
50 yr.	2.2763	
Post-development Runoff Rates (with quantity controls)		
Q (cfs.) 2 yr.	0.2656	
10 yr.	0.3846	
50 yr.	0.4953	
Bypass Area (bypass)		
Number of acres (subtracted from runoff analysis)	0.398	
.		
Offsite Upstream Area		
Number of acres (Upstream of Site)	0.565 acres	
Number of acres (Upstream of Road)	0.0 acres	
Offsite Downstream Flow		
Q (cfs) 100 yr.	0.5445	

Project Overview and Executive Summary

Drainage Plan Description

This Full Drainage Report was prepared in accordance with the 2014 Amended Washington State Department of Ecology Stormwater Management Manual for Western Washington and the City of Issaquah 2017 Stormwater Design Manual Addendum (Manual), Chapter 2.4, Minimum Requirements. The Project is located at 345 & 375 Mine Hill Road SW, Issaquah, Washington (Site) also known as Tax Parcel Numbers 332406-9039, & -9036. This proposed site development involves the subdivision of two parcels into 20 single-family residential lots. Project area includes the Site and a portion of proposed frontage improvements.

See Figures 1 through 7 for maps of the Study Area.

Drainage Basins

Pre-Developed Basin

The total existing Site area is approximately 213,341 s.f. (4.898 acres). The Site is currently developed with three single family homes, gravel driveways, one detached garage, three sheds, and landscaping. The south-eastern portion of the Site appears to be undisturbed and in a forested condition with light underbrush.

The Site slopes from the southwest property corner generally to the northeast property corner. The Site contains four Natural Discharge Points (NDP) and four Natural Discharge Areas (NDA) that combine within a quarter mile of the downstream path, maintaining one Threshold Discharge Areas (TDA). Runoff sheet flows over the Site and is collected in 0194 Mine Hill Creek, on site. The NDP of 0194 Mine Hill Creek is through a 42" diameter pipe. Runoff continues as pipe flow northwest before discharging into Issaquah Creek. Runoff from the remainder of the Site sheet flows over the northern property line from the four NDAs and is collected by the existing drainage system of the Mine Hill Apartments. Runoff flows through the Mine Hill Apartments conveyance system and is also discharged to Issaquah Creek. Runoff that enters Issaquah Creek then flows northwesterly before out letting to Lake Sammamish.

Figure 3 is a map of existing Site conditions. Figure 4 shows the USDA Soils Map. The downstream path of TDA 1 is described in details in downstream analysis.

Post-Developed Basin

The applicant is seeking approval to subdivide 4.898 acres into 20 single–family residential lots (Project), with lot sizes ranging from approximately 2,400 s.f. to 9,350 s.f. Two existing houses will remain undisturbed and will occupy lots 1 and 3. These two lots will remain undisturbed and therefore, will not be counted towards either the predeveloped basin nor the developed basin as they are not target surfaces.

The project is required to provide Standard Flow Control and Basic Treatment plus Phosphorus water quality treatment. The proposed impervious surface areas are generated by the access road connection Clark Street to the proposed Site, minor improvements to Mine Hill Road, Road A, Road B, the 18 new single-family residences and their driveways, and Tract B, the detention facility tract. The remainder of the

developed Site will be modeled as pasture (as prescribed in the Manual, Vol III, Appendix C, C.9 when soils are amended).

Project runoff will discharge at the northeast corner of the Site which is the natural discharge location.

Adjacent Frontage Improvements

The project is proposing to construct an access road from Clark Street to the project Site on existing right-of-way. Minor road widening and parking lane construction will occur on Mine Hill Road.

MINE HILL ROAD

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Minimum Requirement 1:

Full Stormwater Site Plan Narrative

Upstream Analysis

In evaluating the upstream area, we reviewed the USGS topographic survey mapping of the area, and field topographic survey, performed by D.R. STRONG Consulting Engineers, Inc.

Upon evaluation of the upstream area through examining King County topographic map and by conducting field reconnaissance on March 21st 2016, the upstream tributary area for the Site is estimated to be 24,623 s.f. (0.565 acre), from west of the Site. Runoff from the north and east is conveyed northeasterly, away from the project Site. Runoff from the south is collected by the existing stream flowing through the Site and will not impact the project area.

Downstream Analysis

A Site slopes from the southwest property corner generally to the north east property corner. The Site contains one Natural Discharge Point (NDP) and four Natural Discharge Areas (NDA) that combine within a quarter mile of the downstream path, maintaining one Threshold Discharge Areas (TDA). Runoff sheet flows over the Site and is collected in 0194 Mine Hill Creek, on site. The NDP of 0194 Mine Hill Creek is through a 42" diameter pipe. Runoff continues as pipe flow northwest before discharging into Issaquah Creek. Runoff from the remainder of the Site sheet flows over the northern property line from the three NDAs and is collected by the existing drainage system of the Mine Hill Apartments. Runoff flows through the Mine Hill Apartments conveyance system and is also discharged to Issaquah Creek. Runoff that enters Issaquah Creek then flows northwesterly before out letting to Lake Sammamish.

The downstream paths are described in detail below. The downstream area from these points was evaluated by reviewing available resources, and by conducting a field reconnaissance on May 27, 2016 with a weather condition of very light rain. See downstream map and photos in Appendix E for more detail.

During the field investigation, there were no problems observed at the time of the field reconnaissance.

NDA 1 Downstream Path:

"A1" is the Natural Discharge Location 1 (NDL1) located approximately 91' from the northeast property corner. Runoff collected by 0194 Mine Hill Creek enters a 42" diameter plastic pipe. From there, runoff flows northeast as pipe flow until discharging to Issaquah Creek. Runoff continues as channel flow in a northwesterly direction until out letting to Lake Sammamish.

NDA 2 Downstream Path:

Point “A2” is the Natural Drainage Location 2 (NDL2) for the downstream path from the Site located along the northwest property corner. Runoff exist the Site northerly as sheet flow over undisturbed land. From there, runoff flows northerly as sheet flow over forested undisturbed land until it is collected by an unnamed stream. Runoff then flows northerly via channel flow until entering a type 2 catch basin with a bird cage. From there, runoff travels easterly as pipe flow through a series of conveyance pipes and catch basins, until ultimately entering Issaquah creek and out letting into Lake Sammamish.

NDA 3 Downstream Path:

Point “A3” is the third Natural Discharge Location (NDL3) located along the west portion of the northern property line. Runoff flows north as sheet flow through dense, forested vegetation to an impervious asphalt parking lot located in Mine Hill Apartments. From there, runoff continues northerly as sheet flow until reaching a type 1 catch basin located within the Mine Hill Apartments parking lot. The downstream path continues through a series of conveyance pipes and catch basins until combining with runoff from NDA2. Both paths converge and continue north via pipe flow.

NDA 4 Downstream Path:

Point “A4” is the Natural Discharge Location (NDL4) located along the center portion of the northern property line. Runoff first exits the Site as sheet flow over native vegetation and rockery along the edge of the Site. Runoff then enters a type 1 catch basin located in the southeast corner of Mine Hill Apartments, and continues to flow north via pipe flow. Runoff moves through a series of catch basins and conveyance pipes located in the Mine Hill Apartments parking lot, until ultimately converging with and following the same downstream path as NDL3.

FIGURE 1
VICINITY MAP

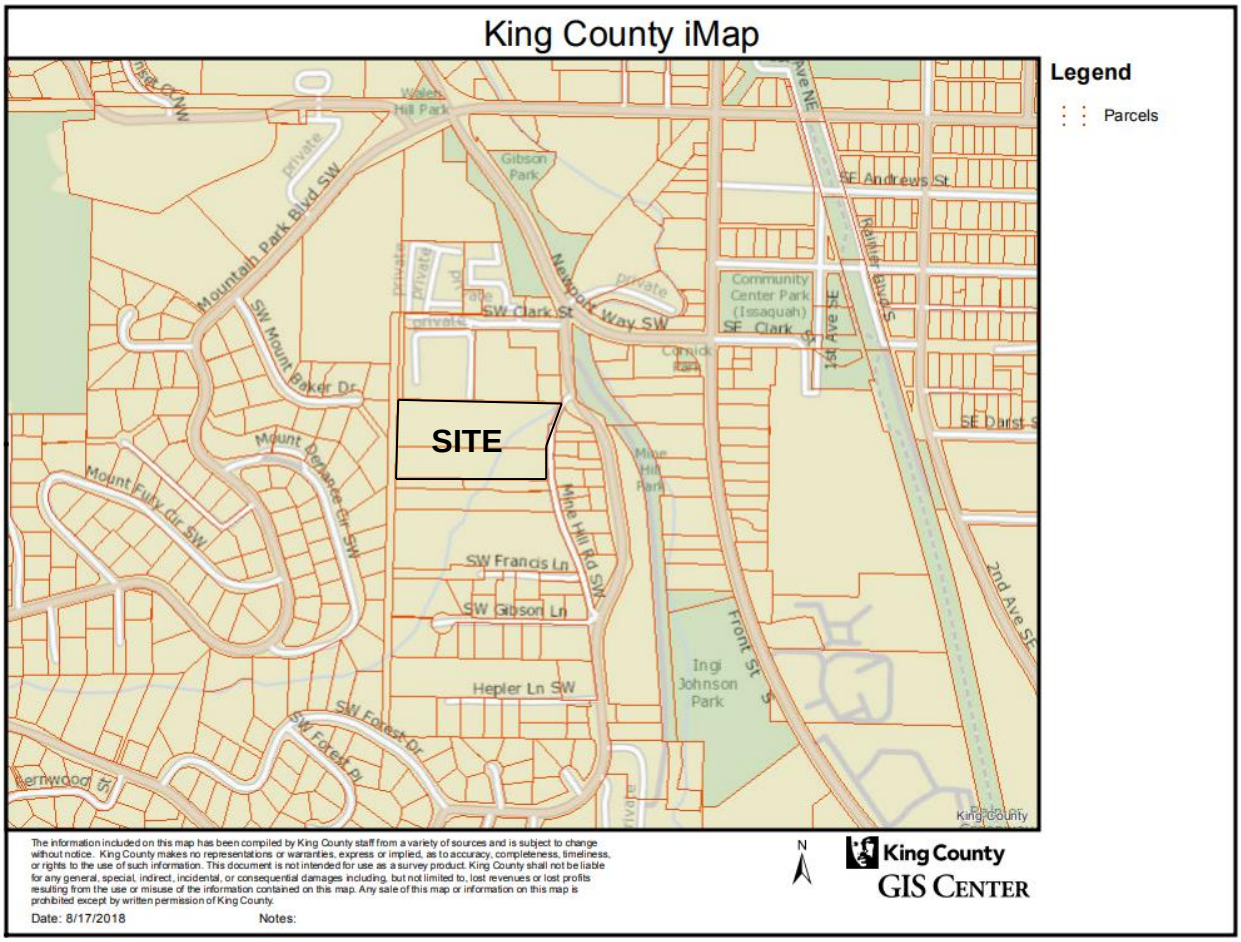


FIGURE 2
AERIAL MAP

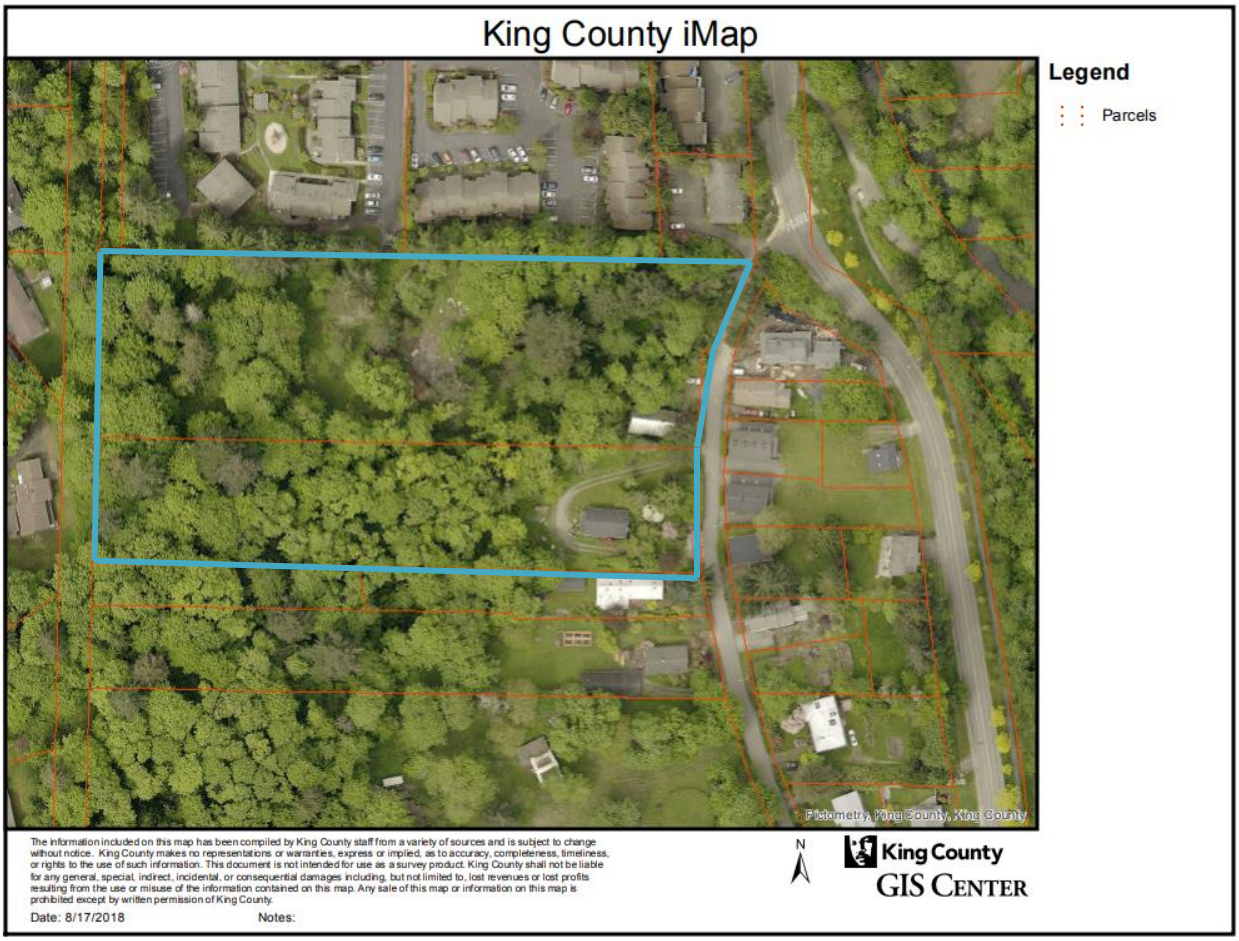
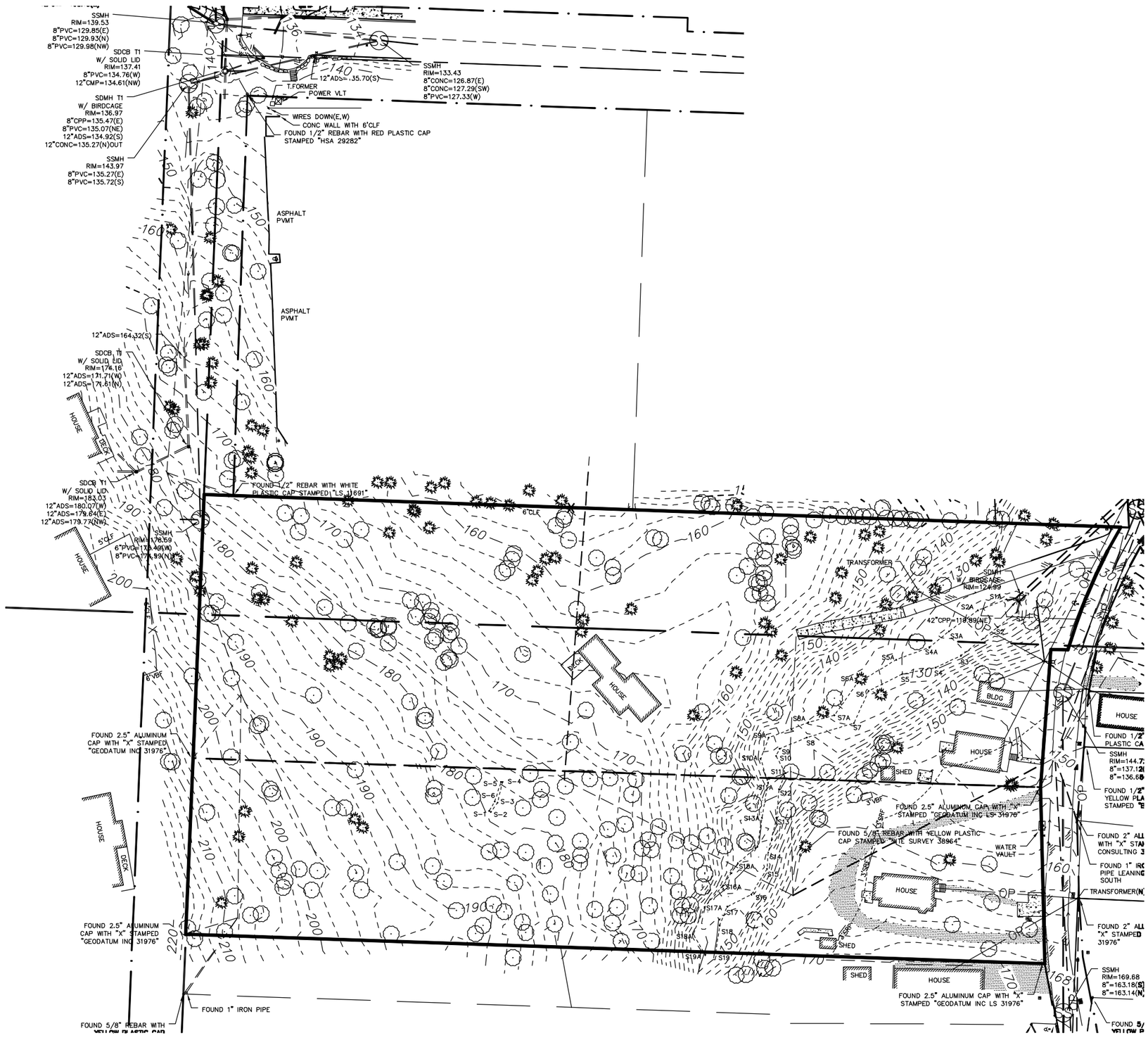


FIGURE 3
EXISTING SITE MAP



NORTH

GRAPHIC SCALE

0 40 80 160

1 INCH = 80 FT.

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FIGURE 3

EXISTING SITE MAP

MINE HILL ROAD

DRAFTED BY: CYW
DESIGNED BY: MAJ
PROJECT ENGINEER: MAJ
DATE: 08.31.18
PROJECT NO.: 14118

FIGURE: 3

FIGURE 4
DOWNSTREAM MAP

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MINE HILL

DOWNSTREAM MAP

345 & 375 MINE HILL RD SW
ISSAQUAH, WA

NORTH

GRAPHIC SCALE
0 100 200 300
1 INCH = 200 FT.

DRAFTED BY: MES
DESIGNED BY: MES
PROJECT ENGINEER: YLP
DATE: 06.09.2016
PROJECT NO.: 14118

FIGURE: 4

FIGURE 5
USDA SOILS MAP

King County Area, Washington

KpC—Kitsap silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1hmtb
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kitsap and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Lacustrine deposits with a minor amount of volcanic ash

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 24 inches: silt loam
H3 - 24 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Other vegetative classification: Soils with Moderate Limitations (G002XN602WA)

Minor Components

Bellingham

Percent of map unit: 2 percent
Landform: Depressions

Tukwila

Percent of map unit: 2 percent
Landform: Depressions

Seattle

Percent of map unit: 1 percent
Landform: Depressions

KpD—Kitsap silt loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 1hmtc
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kitsap and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Lacustrine deposits with a minor amount of volcanic ash

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 40 inches: silt loam
H3 - 40 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Other vegetative classification: Sloping to Steep Soils (G002XN702WA)

Minor Components

Bellingham

Percent of map unit: 1 percent
Landform: Depressions

Tukwila

Percent of map unit: 1 percent
Landform: Depressions

Seattle

Percent of map unit: 1 percent
Landform: Depressions

Minimum Requirement 2:
Construction Stormwater Pollution Prevention Plan (SWPPP)

A complete Construction Stormwater Pollution Prevention Plan will be submitted at the time of final engineering. Each of the 13 construction SWPP elements will be considered and discussed below.

Element 1: Preserve Vegetation/ Mark clearing limits: Vegetation shall be preserved (BMP C101) by restricting construction activities outside of the clearing limits shown. Clearing limits shall be marked with a high visibility plastic fence (BMP C103).

Element 2: Establish construction access: A stabilized construction entrance (BMP C120) will be provided at the location of proposed access road to the Site.

Element 3: Control flow rates: Flow rates shall be controlled by a silt fence (BMP C223) at the downslope edge of the clearing limits and a vegetated strip (BMP C234) between the filter fence and the west property line.

Element 4: Install sediment controls: Sediment shall be controlled by a silt fence (BMP C223) at the downslope edge of the clearing limits and a vegetated strip (BMP C234) between the filter fence and the west property line.

Element 5: Stabilize soils: Unworked soils shall be stabilized with mulching (BMP C121) and/ or dust control (BMP C140) measures. Excavated material will be loaded directly into a dump truck staged on site and therefore, no soil stockpiles are proposed on this site. Final site stabilization will be achieved through compost-amending (BMP T5.13).

Element 6: Protect slopes: Slopes will be protected with compost-amended soils (BMP T5.13) and permanent seeding and planting (BMP C120).

Element 7: Protect drain inlets: Drain inlets will be protected with a catch basin filter insert (BMP C220)

Element 8: Stabilize channels and outlets: No channels or outfalls affected by this project. The flow to the existing man-made culvert will not increase as a result of this project.

Element 9: Control pollutants: Contractor shall implement concrete handling (BMP C151) and material storage, delivery, and containment (BMP C153) measures as well as other appropriate pollution source control measures in areas of: construction equipment maintenance or fueling; handling or storage of waste materials, construction debris, fertilizers, and chemicals; and other activities that may contribute pollutants to stormwater. The following specific requirements apply:

A) Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and

other materials that have potential to pose a threat to human health or the environment.

B) On-site fueling tanks shall include secondary containment.

C) Maintenance, fueling and repair of heavy equipment and vehicles shall be conducted using spill prevention and control measures consistent with Volume IV, Chapters 2 and 3.

D) Contaminated surfaces shall be cleaned immediately following any spill incident.

E) Application of fertilizers and pesticides shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' label requirements for application rates and procedures shall be followed.

F) BMP's shall be used to prevent contamination of stormwater runoff by pH modifying sources. These sources include, but are not limited to, bulk cement, cement kiln dust, fly ash, new concrete washing approved treatment, curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping and mixer washout/ water.

G) Concrete truck chutes, pumps, and internals shall be washed out only into formed areas awaiting installation of concrete. Unused concrete remaining in the truck and pump shall be returned to the originating batch plant for recycling. Washdown from concrete hand tools and work areas shall not drain directly to natural or constructed stormwater conveyances. When no formed areas are available, washwater and leftover product shall be contained in a lined container and disposed of in a manner that does not violate groundwater or surface water quality standards.

H) Where feasible, and not in conflict with International Fire Code, store potential stormwater pollutant materials inside a building or under a cover and/or containment. Liquid and applicable solid materials must be stored in containers suitable for the contents and inspected for corrosion, structural failure, tight fitting lids, leaks and overfills. Store materials in areas sloping away from storm drainage systems or surface waters. Sweep and clean the job site regularly to prevent buildup of contaminating materials. Promptly clean up solid and liquid pollutant leaks and spills and dispose of in a manner consistent with and all other federal, state, and local regulations in order to prevent stormwater pollution.

Element 10: Control de-watering: There are no dewatering operations planned for this project.

Element 11: Maintain BMPs: BMP's shall be inspected and maintained by the contractor during construction and removed within 30 days after the

City determines that the site is stabilized, provided that temporary BMP's may be removed when they are no longer needed.

Element 12: Manage the project: This plan shall be fully implemented at all times and modified whenever there is a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to waters of the State.

Element 13: Protect Low Impact Development (LID) BMPs: Permittees must protect all bioretention and rain garden facilities from sedimentation through installation and maintenance of erosion and sediment control BMPS on portions of the site that drain into the bioretention and/or rain garden facilities. Restore the facilities to their fully functioning condition if they accumulate sediment during construction. Restoring the facility must include removal of sediment and any sediment-laden bioretention/rain garden soils, and replacing the removed soils with soils meeting the design specification.

Permittees must maintain the infiltration capabilities of bioretention and rain garden facilities by protecting against compaction by construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.

Permittees must control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements.

Permittees must clean permeable pavements fouled with sediments or no longer passing an initial infiltration test using local stormwater manual methodology or the manufacturer's procedures.

Permittees must keep all heavy equipment off existing soils under lid facilities that have been excavated to final grade to retain the infiltration rate of the soils.

Minimum Requirement 3:
Source Control of Pollution

Mobile fueling of vehicles and heavy equipment will occur on the Site during construction activities. The following BMP's must be implemented:

- All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.
- On-site fueling tanks and petroleum product storage containers shall include secondary containment.
- Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment.
- In order to perform emergency repairs on site, temporary plastic will be placed beneath and if raining, over the vehicle.
- Contaminated surfaces shall be cleaned immediately following any discharge or spill incident.

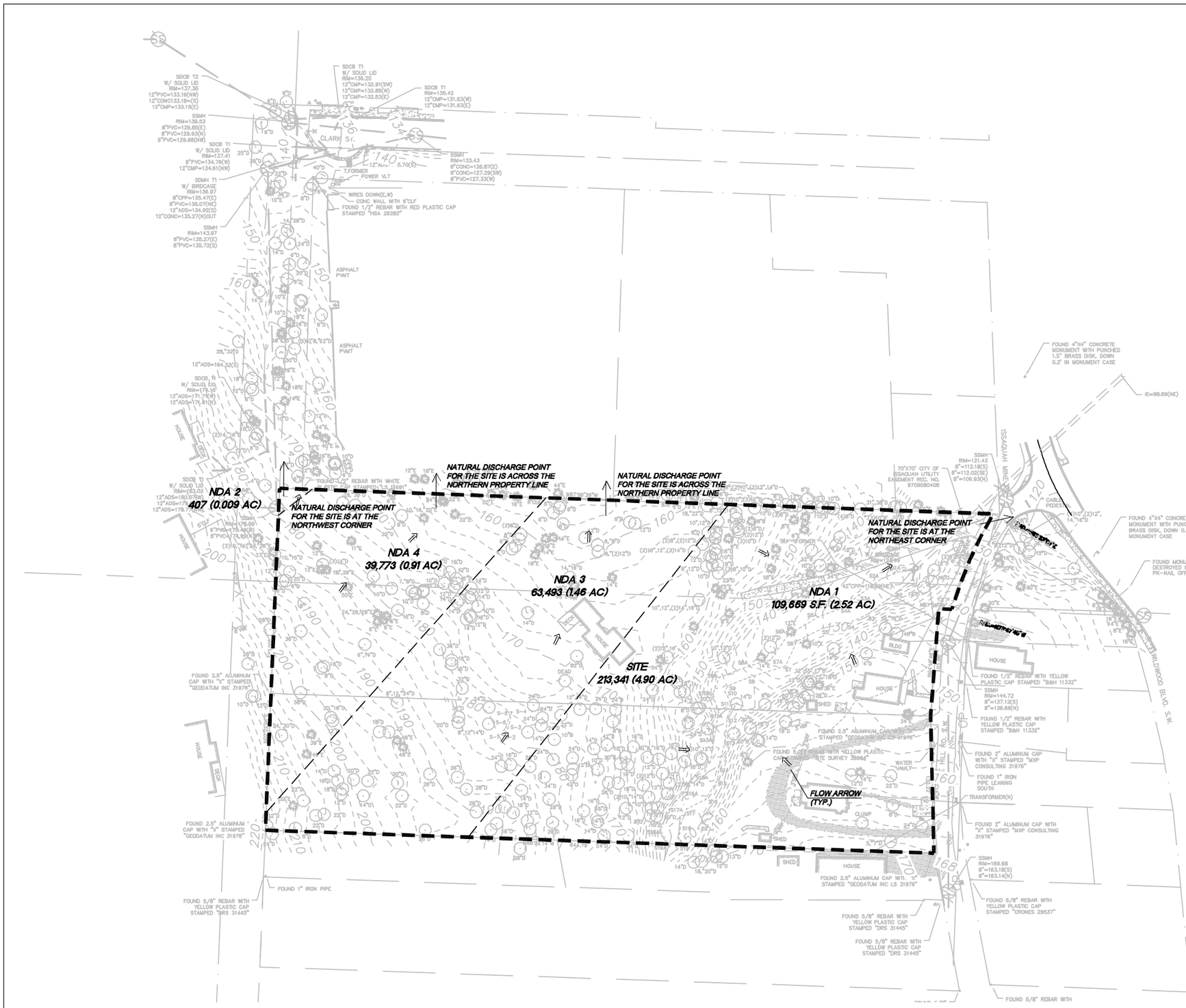
Minimum Requirement 4:
Preservation of Natural Drainage Systems or Outfalls and Provision of Off-Site Mitigation

The Project consists of one Threshold Discharge Area (TDA1). The TDA1 contains four Natural Discharge Areas (NDA 1, NDA 2, NDA 3 and NDA 4) and Natural Discharge Locations (NDLs). Existing runoff from (TDA 1, NDA 1) flows northeasterly and leaves the Site as sheet flow near northeast property corner. The existing runoff from westerly one-third of the Site (TDA 1, NDA 1A) flows northeasterly, northwesterly and north leaves the Site as sheet flow across north property line. Based on an inspection of the USGS topographic survey of the area, runoff naturally drains northeast for TDA1. Developed runoff from TDA1 will be collected, treated for water quality and detained in detention vaults.

Project runoff will continue to discharge at the natural discharge location which is the northeast corner of the Site. Mitigated flows released from the vault will be conveyed through a series of pipes and catch basins to the existing public storm drainage.

In the pre-developed condition, see Figure 7, the Site is modeled as “Forest,” and upstream run-on areas are modeled as “Grass” and “Pasture” where appropriate. In the developed condition, see Figure 8, Project surfaces will be as shown. The proposed detention facilities will match developed condition’s durations to the pre-developed durations ranging from 50% of the two-year peak flow up to the full 50-year peak flow. Maintaining this rate, the proposed development would not create or aggravate a “severe flooding problem” or “severe erosion problem”. No drainage impacts are anticipated as a result of the proposed Project improvements.

FIGURE 6
DRAINAGE BASINS, SUBBASINS AND SITE CHARACTERISTICS



NORTH

GRAPHIC SCALE
0 50 100 150
1 INCH = 100 FT.

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FIGURE 6

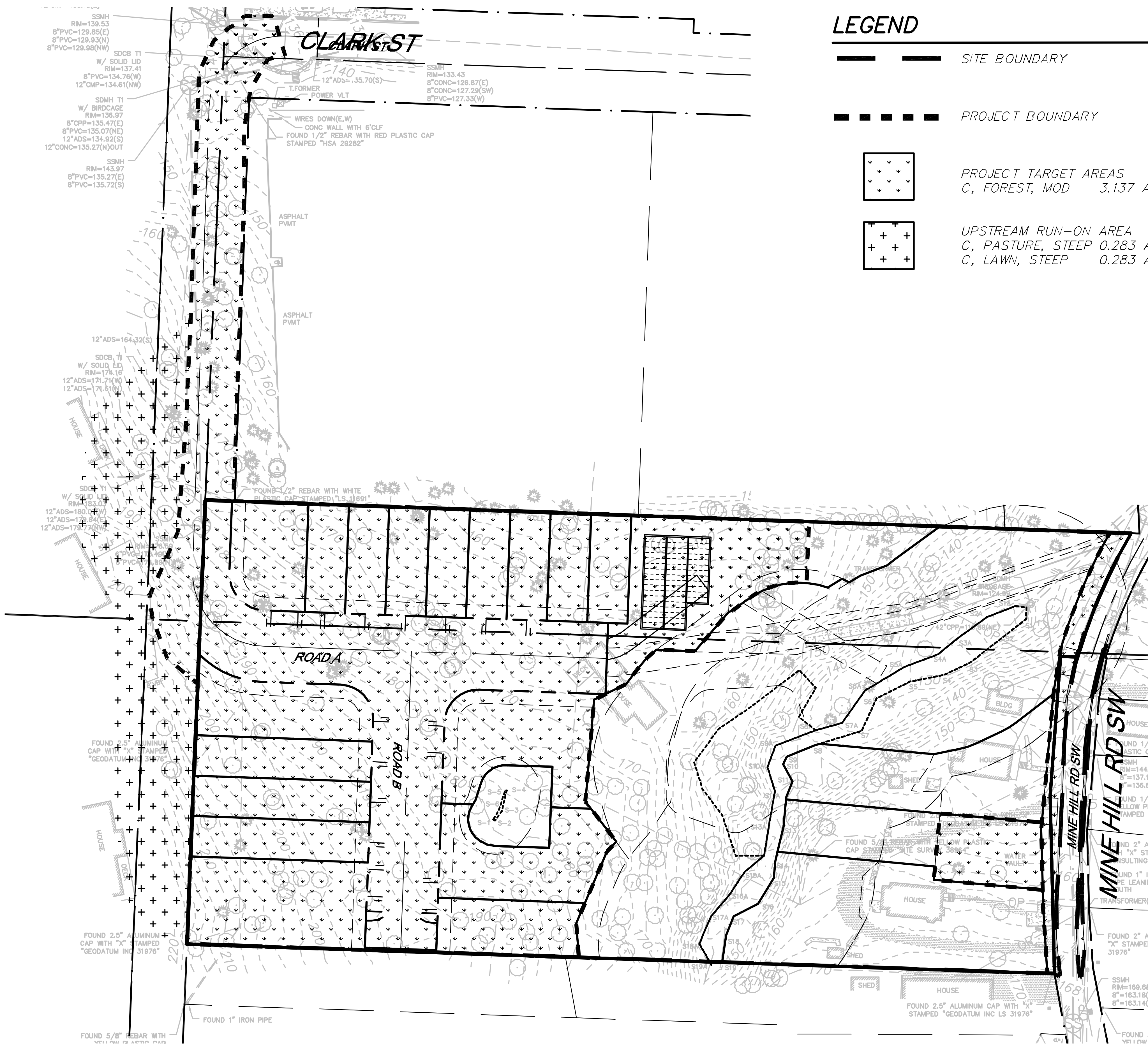
DRAINAGE BASINS, SUBBASINS, AND SITE CHARACTERISTICS

345 & 375 MINE HILL ROAD SW
ISSAQUAH, WA

DRAFTED BY: MES
DESIGNED BY: MES
PROJECT ENGINEER: MAJ
DATE: 08.31.18
PROJECT NO.: 14118

FIGURE: 6

FIGURE 7
PREDEVELOPED SITE CONDITIONS



LEGEND

- SITE BOUNDARY
- PROJECT BOUNDARY
- PROJECT TARGET AREAS
  C, FOREST, MOD 3.137 AC.
- UPSTREAM RUN-ON AREA
  C, PASTURE, STEEP 0.283 AC.
  C, LAWN, STEEP 0.283 AC.

NORTH

GRAPHIC SCALE

0 40 80 160

1 INCH = 80 FT.

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FIGURE 7
PREDEVELOPED SITE CONDITIONS
MINE HILL ROAD

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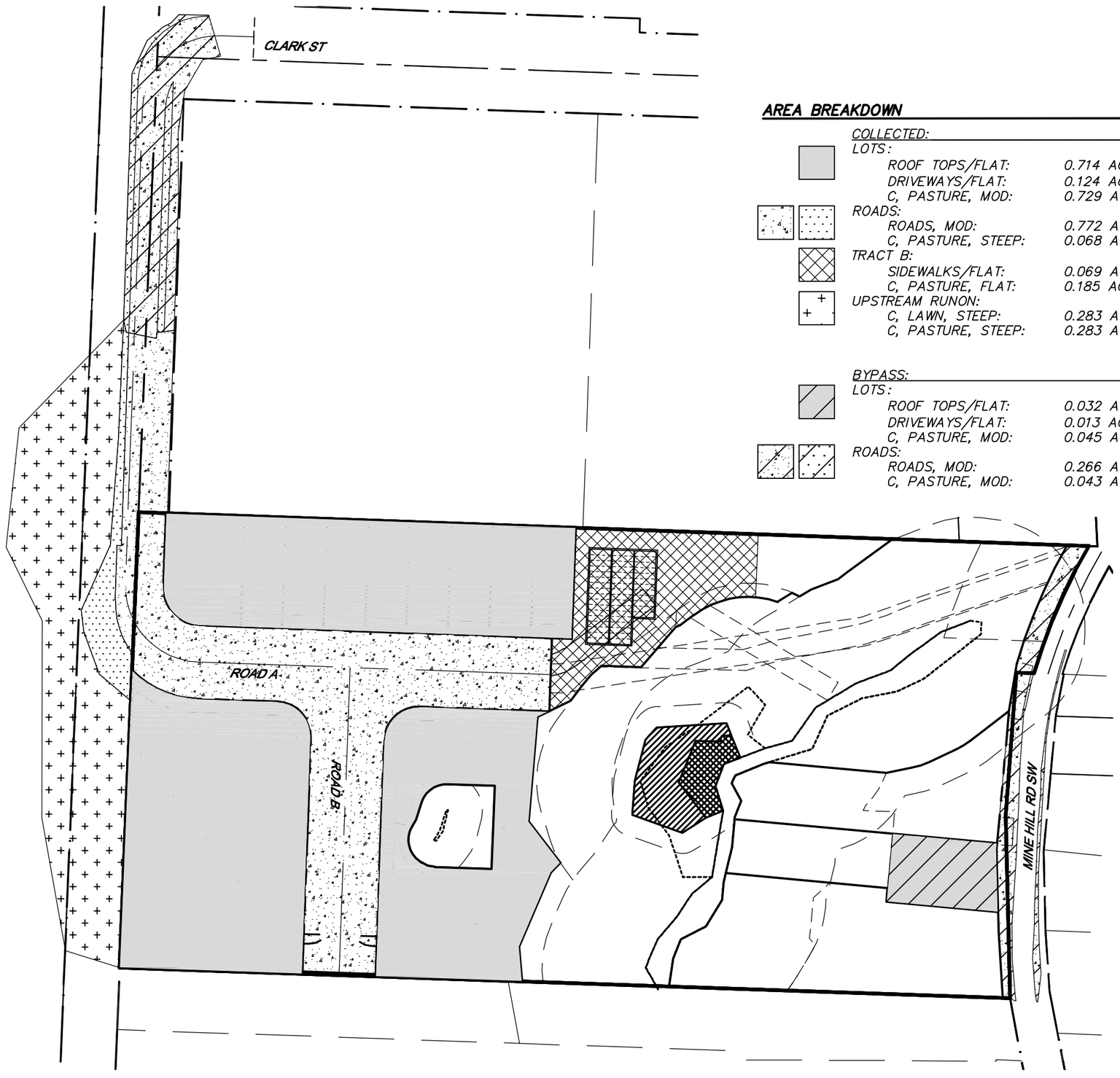
DESIGNED BY: MAJ
PROJECT ENGINEER: MAJ
DATE: 08.31.18
PROJECT NO.: 14118

FIGURE: 7

FIGURE 8
DEVELOPED SITE CONDITIONS



AREA BREAKDOWN

COLLECTED:

LOTS:

ROOF TOPS/FLAT:	0.714 AC.
DRIVEWAYS/FLAT:	0.124 AC.
C, PASTURE, MOD:	0.729 AC.

ROADS:

ROADS, MOD:	0.772 AC.
C, PASTURE, STEEP:	0.068 AC.

TRACT B:

SIDEWALKS/FLAT:	0.069 AC.
C, PASTURE, FLAT:	0.185 AC.

UPSTREAM RUNON:

C, LAWN, STEEP:	0.283 AC.
C, PASTURE, STEEP:	0.283 AC.

BYPASS:

LOTS:

ROOF TOPS/FLAT:	0.032 AC.
DRIVEWAYS/FLAT:	0.013 AC.
C, PASTURE, MOD:	0.045 AC.

ROADS:

ROADS, MOD:	0.266 AC.
C, PASTURE, MOD:	0.043 AC.

NORTH

GRAPHIC SCALE

0 40 80 160

1 INCH = 80 FT.

D.R. STRONG
CONSULTING ENGINEERS

DRS

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FIGURE 8

DEVELOPED SITE CONDITIONS

MINE HILL ROAD

DRAFTED BY: MAJ
DESIGNED BY: MAJ
PROJECT ENGINEER: MAJ
DATE: 08.31.18
PROJECT NO.: 14118

FIGURE: 8

Minimum Requirement 5:
On-site Stormwater Management

The Project triggers MR's 1 – 9 and is therefore required to evaluate the List #2 BMP's in accordance with the Manual.

Lawn and Landscaped Areas:

1. The Project will implement BMP T5.13 Post-Construction Soil Quality and Depth in accordance with the Manual. Within the limits of Site disturbance, duff and topsoil (where available) will be retained in an undisturbed state and stockpiled for later use to stabilize and amend soils throughout the Site. Soil amendment will be accomplished by tilling three inches of compost eight inches into disturbed soil in the areas of planting beds or by tilling two inches of compost eight inches into disturbed soil in the areas of lawn turf. Two to four inches of arborist wood chip, coarse bark mulch, or compost mulch shall be added to planting beds after final planting.

Roofs:

1. Full dispersion is not feasible because the minimum 100' vegetated flowpath cannot be provided due to lot sizes. Lots were created per zoning codes to meet maximum net density.
2. Bioretention planters will be utilized for roof drains to the maximum extent feasible.
3. Downspout dispersion systems are not feasible because the minimum 25' vegetated flowpath cannot be provided.
4. Perforated stub-out connections will be used for individual lot roof downspout collection systems that cannot be served by bioretention planters.

Driveways:

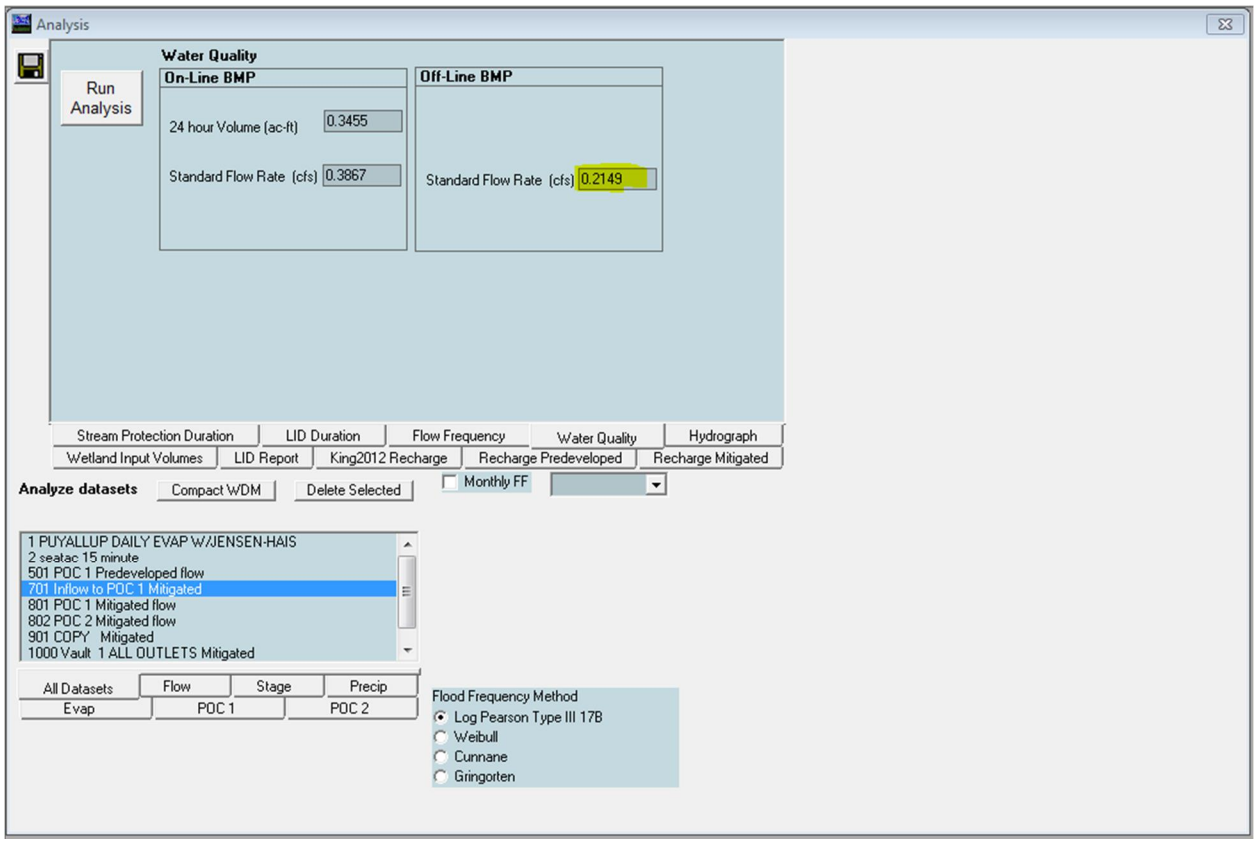
1. Full dispersion is not feasible because the minimum 100' vegetated flowpath cannot be provided due to lot sizes. Lots were created per zoning codes to meet maximum net density.
2. Permeable pavement is not feasible due to mass grading on the Site that will remove and disturb upper layers of till soil and/or place fill material that is unsuitable for infiltration.
3. Bioretention planters will be utilized for driveway runoff to the maximum extent feasible.
4. Sheet flow dispersion with minimum 10' flowpath will be used for driveways that cannot be served by bioretention planters.

BMP T5.20 Preserving Natural Vegetation; and BMP T5.21 Better Site Design:

- Converted pervious areas will discharge runoff as dispersed sheet flow.
- Required open space and landscape elements will provide a dispersal zone for PGPS.
- The development is designed to minimize the Site disturbance area. Native vegetation will be retained as much as possible within the limits of Site disturbance to maximum soil permeability and enhance dispersal BMP effectiveness.

Minimum Requirement 6:
Run-off Treatment Requirements

A CONTECH StormFilter using PhosphoSorb Media immediately following the proposed detention vault will meet basic water quality plus phosphorus water treatment requirements. An offline flow of 0.2149 cfs will be used to size the stormfilter.



Minimum Requirement 7:
Flow Control Requirements

A continuous simulation model, WWHM 2012, version 4.2.13 was used to analyze the pre- and post- developed runoff rates. The soil type is modeled as hydrologic soil group C for the Kitsap silt loam SCS classification as shown in Figure 4. In the pre-developed condition, the entire Site is modeled as “Forest”. Upstream run-on areas are modeled as “Grass” and “Pasture” where appropriate. In post-development conditions, the soil types are unchanged from the pre-developed conditions. The developed Site tributary to the proposed detention vault is modeled as “Pasture” and “Impervious” as appropriate. Results of the WWHM2012 analysis are included in Appendix A.

One detention vault will provide flow control for Project runoff. The vault detention volume required is 42,135 c.f. and provided is 42,748 c.f. with 15.0 ft. of live storage depth.

Site Area Analysis

The following tables represent the project areas breakdown for existing and design input in WWHM2012.

Performance Standards

The detention facility has been designed to meet the requirements of the Manual. Infiltration is not feasible; therefore the facility will match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the two-year peak flow up to the full 50-year peak flow.

Predev	157953	3.626
till forest Mod	133331	3.061
till pasture Steep	12311	0.283
till grass Steep	12311	0.283
Rd In	140592	3.228
Roads Mod	33645	0.772
Roof Flat	31100	0.714
Driveways Flat	5400	0.124
Sidewalks Flat	3000	0.069
Till Grass Steep	12311	0.283
Till Pasture Mod	31776	0.729
Till Pasture Flat	8067	0.185
Till Pasture Steep	15293	0.351
Bypass	17361	0.399
Roads Mod	11605	0.266
Till Pasture Mod	3806	0.087
Roof Top Flat	1400	0.032
Driveway Flat	550	0.013

FIGURE 9
DETENTION AND WATER QUALITY FACILITY DETAILS

To be prepared for Engineering Submittal.

Minimum Requirement 8:
Wetland Protection

The proposed stormwater system will be designed to minimize or eliminate entry of waste materials or pollutants to ground water resources and/or surface waters downstream of the Site.

Minimum Requirement 9:
Operation and Maintenance Manual

To maximize the effectiveness of the On-Site Stormwater Management BMP's the following practices should be implemented as part of an overall Site management program:

- Soil quality and depth should be established toward the end of construction and once established, should be protected from compaction, such as from large machinery, use, and from erosion.
- Soil should be planted and mulched after installation.
- Plant debris or its equivalent should be left on the soil surface to replenish organic matter.
- An Operation and Maintenance excerpt from the Manual will be included at time of Engineering submittal.

APPENDIX A
WWHM ANALYSIS

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Vault
Site Name:	Mine Hill
Site Address:	
City:	
Report Date:	4/3/2020
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.000 (adjusted)
Version Date:	2018/10/10
Version:	4.2.16

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Forest, Mod	3.061
C, Pasture, Steep	0.283
C, Lawn, Steep	0.283
Pervious Total	3.627

Impervious Land Use	acre
Impervious Total	0
Basin Total	3.627

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

RD In

Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Steep	0.283
C, Pasture, Flat	0.185
C, Pasture, Mod	0.729
C, Pasture, Steep	0.351
Pervious Total	1.548

Impervious Land Use	acre
ROADS MOD	0.772
ROOF TOPS FLAT	0.714
DRIVEWAYS FLAT	0.124
SIDEWALKS FLAT	0.069
Impervious Total	1.679
Basin Total	3.227

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Bypass

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Mod	0.087
Pervious Total	0.087

Impervious Land Use	acre
ROADS MOD	0.266
ROOF TOPS FLAT	0.032
DRIVEWAYS FLAT	0.013
Impervious Total	0.311
Basin Total	0.398

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 53 ft.
Length: 53 ft.
Depth: 16 ft.
Discharge Structure
Riser Height: 15 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1.216 in. Elevation:0 ft.
Orifice 2 Diameter: 2.11 in. Elevation:12.57275 ft.
Element Flows To:
Outlet 1 Outlet 2

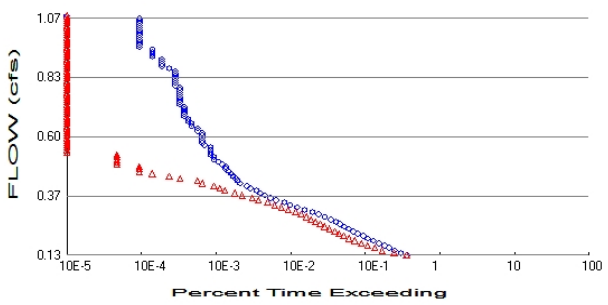
Vault Hydraulic Table

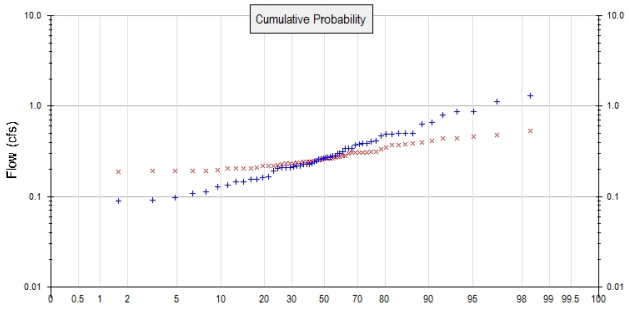
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.064	0.000	0.000	0.000
0.1778	0.064	0.011	0.016	0.000
0.3556	0.064	0.022	0.023	0.000
0.5333	0.064	0.034	0.029	0.000
0.7111	0.064	0.045	0.033	0.000
0.8889	0.064	0.057	0.037	0.000
1.0667	0.064	0.068	0.041	0.000
1.2444	0.064	0.080	0.044	0.000
1.4222	0.064	0.091	0.047	0.000
1.6000	0.064	0.103	0.050	0.000
1.7778	0.064	0.114	0.053	0.000
1.9556	0.064	0.126	0.056	0.000
2.1333	0.064	0.137	0.058	0.000
2.3111	0.064	0.149	0.061	0.000
2.4889	0.064	0.160	0.063	0.000
2.6667	0.064	0.172	0.065	0.000
2.8444	0.064	0.183	0.067	0.000
3.0222	0.064	0.194	0.069	0.000
3.2000	0.064	0.206	0.071	0.000
3.3778	0.064	0.217	0.073	0.000
3.5556	0.064	0.229	0.075	0.000
3.7333	0.064	0.240	0.077	0.000
3.9111	0.064	0.252	0.079	0.000
4.0889	0.064	0.263	0.081	0.000
4.2667	0.064	0.275	0.082	0.000
4.4444	0.064	0.286	0.084	0.000
4.6222	0.064	0.298	0.086	0.000
4.8000	0.064	0.309	0.087	0.000
4.9778	0.064	0.321	0.089	0.000
5.1556	0.064	0.332	0.091	0.000
5.3333	0.064	0.343	0.092	0.000
5.5111	0.064	0.355	0.094	0.000
5.6889	0.064	0.366	0.095	0.000
5.8667	0.064	0.378	0.097	0.000
6.0444	0.064	0.389	0.098	0.000
6.2222	0.064	0.401	0.100	0.000
6.4000	0.064	0.412	0.101	0.000
6.5778	0.064	0.424	0.102	0.000
6.7556	0.064	0.435	0.104	0.000

6.9333	0.064	0.447	0.105	0.000
7.1111	0.064	0.458	0.107	0.000
7.2889	0.064	0.470	0.108	0.000
7.4667	0.064	0.481	0.109	0.000
7.6444	0.064	0.493	0.110	0.000
7.8222	0.064	0.504	0.112	0.000
8.0000	0.064	0.515	0.113	0.000
8.1778	0.064	0.527	0.114	0.000
8.3556	0.064	0.538	0.116	0.000
8.5333	0.064	0.550	0.117	0.000
8.7111	0.064	0.561	0.118	0.000
8.8889	0.064	0.573	0.119	0.000
9.0667	0.064	0.584	0.120	0.000
9.2444	0.064	0.596	0.122	0.000
9.4222	0.064	0.607	0.123	0.000
9.6000	0.064	0.619	0.124	0.000
9.7778	0.064	0.630	0.125	0.000
9.9556	0.064	0.642	0.126	0.000
10.133	0.064	0.653	0.127	0.000
10.311	0.064	0.664	0.128	0.000
10.489	0.064	0.676	0.130	0.000
10.667	0.064	0.687	0.131	0.000
10.844	0.064	0.699	0.132	0.000
11.022	0.064	0.710	0.133	0.000
11.200	0.064	0.722	0.134	0.000
11.378	0.064	0.733	0.135	0.000
11.556	0.064	0.745	0.136	0.000
11.733	0.064	0.756	0.137	0.000
11.911	0.064	0.768	0.138	0.000
12.089	0.064	0.779	0.139	0.000
12.267	0.064	0.791	0.140	0.000
12.444	0.064	0.802	0.141	0.000
12.622	0.064	0.814	0.169	0.000
12.800	0.064	0.825	0.201	0.000
12.978	0.064	0.836	0.221	0.000
13.156	0.064	0.848	0.237	0.000
13.333	0.064	0.859	0.251	0.000
13.511	0.064	0.871	0.264	0.000
13.689	0.064	0.882	0.276	0.000
13.867	0.064	0.894	0.286	0.000
14.044	0.064	0.905	0.296	0.000
14.222	0.064	0.917	0.306	0.000
14.400	0.064	0.928	0.315	0.000
14.578	0.064	0.940	0.324	0.000
14.756	0.064	0.951	0.332	0.000
14.933	0.064	0.963	0.340	0.000
15.111	0.064	0.974	0.936	0.000
15.289	0.064	0.985	2.730	0.000
15.467	0.064	0.997	4.689	0.000
15.644	0.064	1.008	6.019	0.000
15.822	0.064	1.020	6.803	0.000
16.000	0.064	1.031	7.470	0.000
16.178	0.064	1.043	8.081	0.000
16.356	0.000	0.000	8.648	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.627
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.635
Total Impervious Area: 1.99

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.26839
5 year	0.462443
10 year	0.622027
25 year	0.861227
50 year	1.068134
100 year	1.300866

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.265642
5 year	0.336443
10 year	0.384648
25 year	0.447278
50 year	0.495282
100 year	0.544508

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.485	0.312
1950	0.469	0.306
1951	0.380	0.370
1952	0.156	0.188
1953	0.114	0.204
1954	0.193	0.210
1955	0.257	0.224
1956	0.311	0.237
1957	0.299	0.267
1958	0.208	0.207

1959	0.164	0.204
1960	0.387	0.305
1961	0.209	0.252
1962	0.108	0.190
1963	0.225	0.230
1964	0.263	0.231
1965	0.271	0.241
1966	0.160	0.195
1967	0.504	0.312
1968	0.269	0.347
1969	0.229	0.246
1970	0.233	0.245
1971	0.284	0.265
1972	0.387	0.264
1973	0.144	0.190
1974	0.298	0.262
1975	0.341	0.275
1976	0.244	0.241
1977	0.216	0.220
1978	0.209	0.256
1979	0.091	0.310
1980	0.800	0.400
1981	0.206	0.255
1982	0.494	0.374
1983	0.284	0.275
1984	0.147	0.190
1985	0.127	0.242
1986	0.342	0.263
1987	0.339	0.299
1988	0.134	0.193
1989	0.098	0.281
1990	1.317	0.444
1991	0.657	0.384
1992	0.220	0.217
1993	0.156	0.204
1994	0.088	0.171
1995	0.212	0.216
1996	0.638	0.379
1997	0.400	0.409
1998	0.248	0.266
1999	0.870	0.438
2000	0.229	0.232
2001	0.067	0.282
2002	0.374	0.335
2003	0.499	0.310
2004	0.497	0.461
2005	0.275	0.235
2006	0.261	0.225
2007	1.119	0.485
2008	0.877	0.537
2009	0.412	0.310

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.3168	0.5371
2	1.1187	0.4846
3	0.8774	0.4613

4	0.8697	0.4443
5	0.7996	0.4378
6	0.6573	0.4092
7	0.6382	0.3995
8	0.5035	0.3844
9	0.4989	0.3794
10	0.4967	0.3742
11	0.4943	0.3705
12	0.4849	0.3470
13	0.4687	0.3350
14	0.4125	0.3125
15	0.4002	0.3118
16	0.3874	0.3099
17	0.3872	0.3098
18	0.3802	0.3096
19	0.3738	0.3059
20	0.3417	0.3050
21	0.3412	0.2987
22	0.3389	0.2818
23	0.3113	0.2814
24	0.2990	0.2748
25	0.2979	0.2747
26	0.2843	0.2669
27	0.2837	0.2665
28	0.2755	0.2653
29	0.2710	0.2640
30	0.2689	0.2630
31	0.2634	0.2616
32	0.2609	0.2564
33	0.2571	0.2552
34	0.2478	0.2519
35	0.2435	0.2459
36	0.2330	0.2447
37	0.2288	0.2418
38	0.2286	0.2410
39	0.2250	0.2408
40	0.2200	0.2371
41	0.2162	0.2349
42	0.2123	0.2322
43	0.2089	0.2311
44	0.2088	0.2304
45	0.2080	0.2254
46	0.2064	0.2243
47	0.1932	0.2196
48	0.1637	0.2172
49	0.1603	0.2162
50	0.1561	0.2103
51	0.1555	0.2066
52	0.1468	0.2037
53	0.1440	0.2037
54	0.1336	0.2035
55	0.1269	0.1954
56	0.1135	0.1925
57	0.1076	0.1902
58	0.0978	0.1901
59	0.0906	0.1900
60	0.0883	0.1876
61	0.0667	0.1710

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1342	7685	7604	98	Pass
0.1436	6391	5195	81	Pass
0.1531	5230	3593	68	Pass
0.1625	4462	2843	63	Pass
0.1719	3856	2284	59	Pass
0.1814	3238	1876	57	Pass
0.1908	2753	1557	56	Pass
0.2002	2329	1288	55	Pass
0.2097	2014	1092	54	Pass
0.2191	1685	940	55	Pass
0.2285	1478	830	56	Pass
0.2380	1267	712	56	Pass
0.2474	1111	609	54	Pass
0.2568	969	529	54	Pass
0.2663	858	456	53	Pass
0.2757	744	400	53	Pass
0.2851	612	346	56	Pass
0.2946	505	294	58	Pass
0.3040	415	247	59	Pass
0.3134	328	198	60	Pass
0.3229	263	161	61	Pass
0.3323	208	131	62	Pass
0.3417	176	105	59	Pass
0.3512	135	79	58	Pass
0.3606	113	65	57	Pass
0.3700	96	48	50	Pass
0.3795	84	38	45	Pass
0.3889	74	28	37	Pass
0.3983	61	24	39	Pass
0.4078	55	20	36	Pass
0.4172	45	14	31	Pass
0.4266	41	12	29	Pass
0.4361	39	7	17	Pass
0.4455	36	5	13	Pass
0.4549	34	3	8	Pass
0.4644	32	2	6	Pass
0.4738	29	2	6	Pass
0.4832	29	2	6	Pass
0.4927	26	1	3	Pass
0.5021	23	1	4	Pass
0.5115	20	1	5	Pass
0.5210	20	1	5	Pass
0.5304	18	1	5	Pass
0.5398	18	0	0	Pass
0.5493	18	0	0	Pass
0.5587	18	0	0	Pass
0.5681	15	0	0	Pass
0.5776	14	0	0	Pass
0.5870	14	0	0	Pass
0.5964	14	0	0	Pass
0.6059	14	0	0	Pass
0.6153	14	0	0	Pass
0.6247	12	0	0	Pass

0.6342	12	0	0	Pass
0.6436	10	0	0	Pass
0.6531	10	0	0	Pass
0.6625	9	0	0	Pass
0.6719	9	0	0	Pass
0.6814	8	0	0	Pass
0.6908	8	0	0	Pass
0.7002	8	0	0	Pass
0.7097	8	0	0	Pass
0.7191	8	0	0	Pass
0.7285	7	0	0	Pass
0.7380	7	0	0	Pass
0.7474	7	0	0	Pass
0.7568	7	0	0	Pass
0.7663	7	0	0	Pass
0.7757	7	0	0	Pass
0.7851	7	0	0	Pass
0.7946	7	0	0	Pass
0.8040	6	0	0	Pass
0.8134	6	0	0	Pass
0.8229	6	0	0	Pass
0.8323	6	0	0	Pass
0.8417	6	0	0	Pass
0.8512	6	0	0	Pass
0.8606	6	0	0	Pass
0.8700	5	0	0	Pass
0.8795	4	0	0	Pass
0.8889	4	0	0	Pass
0.8983	4	0	0	Pass
0.9078	4	0	0	Pass
0.9172	3	0	0	Pass
0.9266	3	0	0	Pass
0.9361	3	0	0	Pass
0.9455	3	0	0	Pass
0.9549	2	0	0	Pass
0.9644	2	0	0	Pass
0.9738	2	0	0	Pass
0.9832	2	0	0	Pass
0.9927	2	0	0	Pass
1.0021	2	0	0	Pass
1.0115	2	0	0	Pass
1.0210	2	0	0	Pass
1.0304	2	0	0	Pass
1.0398	2	0	0	Pass
1.0493	2	0	0	Pass
1.0587	2	0	0	Pass
1.0681	2	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.3455 acre-feet
On-line facility target flow:	0.3867 cfs.
Adjusted for 15 min:	0.3867 cfs.
Off-line facility target flow:	0.2149 cfs.
Adjusted for 15 min:	0.2149 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Vault 1 POC	☐	488.16			☐	0.00			
Total Volume Infiltrated		488.16	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

POC 2

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

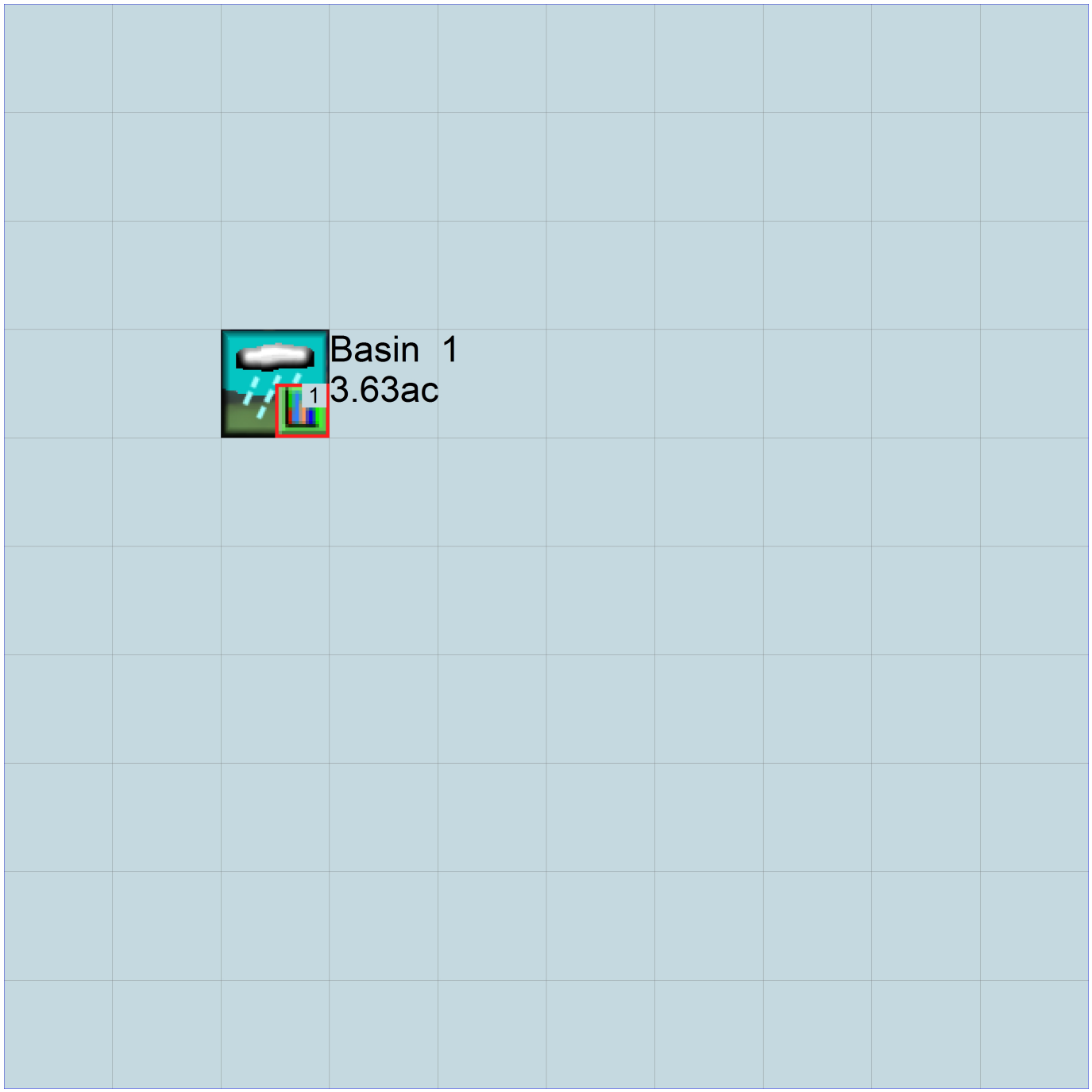
PERLND Changes

No PERLND changes have been made.

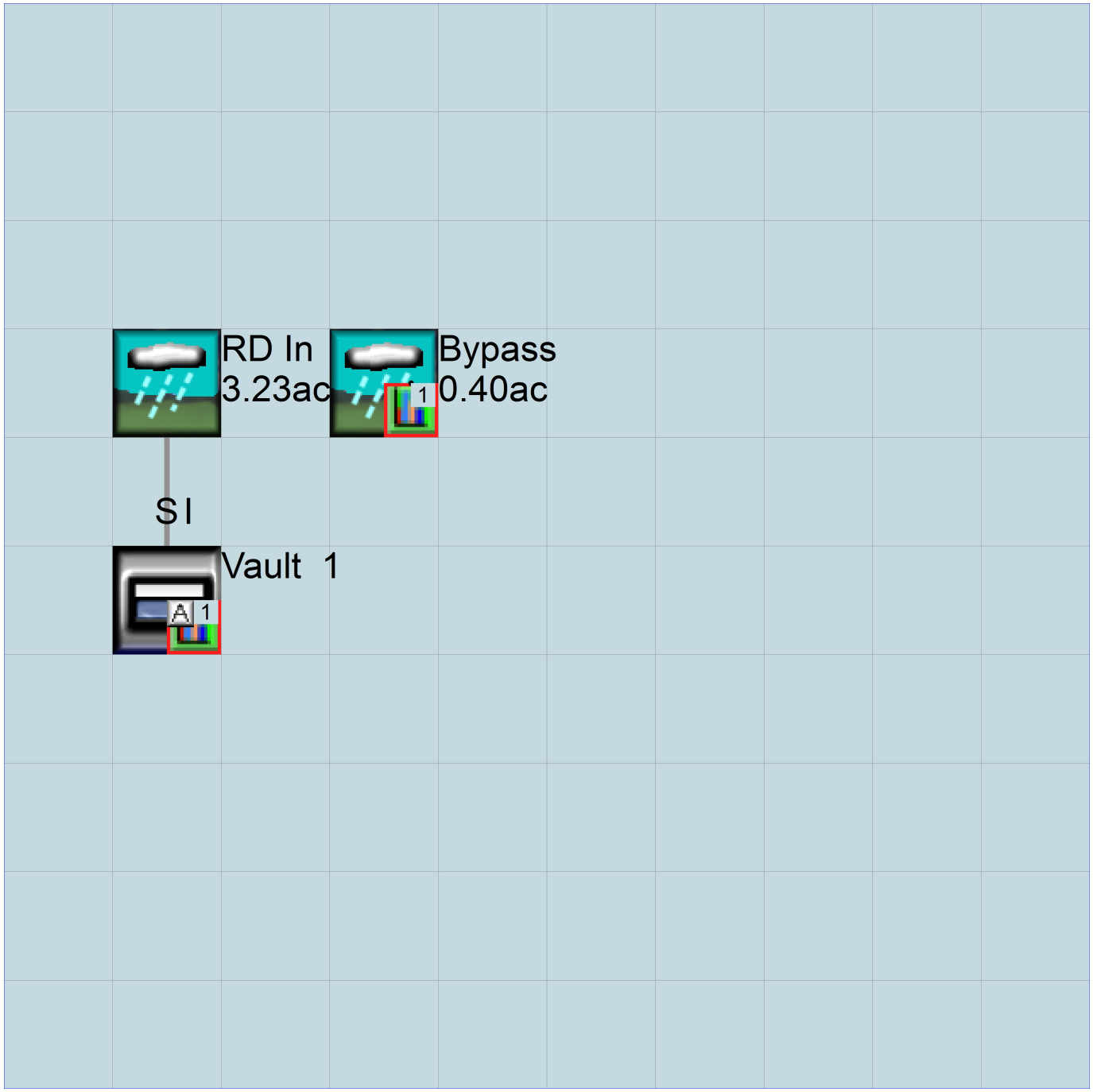
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Vault.wdm
MESSU       25   PreVault.MES
            27   PreVault.L61
            28   PreVault.L62
            30   POCVault1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      11
      PERLND      15
      PERLND      18
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   11     C, Forest, Mod          1    1    1    1   27    0
   15     C, Pasture, Steep       1    1    1    1   27    0
   18     C, Lawn, Steep          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
   15         0    0    1    0    0    0    0    0    0    0    0    0
   18         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   15         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   18         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    0    0    0    0    0    0    0    0    0    0
   15         0    0    0    0    0    0    0    0    0    0    0
   18         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       4.5      0.08       400       0.1       0.5     0.996
   15              0       4.5      0.06       400      0.15       0.5     0.996
   18              0       4.5      0.03       400      0.15       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11             0         0         2         2         0         0         0
   15             0         0         2         2         0         0         0
   18             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                          ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11          0.2       0.5      0.35         6       0.5       0.7
   15         0.15      0.25       0.3         6       0.3       0.4
   18          0.1      0.15      0.25         6       0.3      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS      GWVS
   11             0         0         0         0       2.5          1         0
   15             0         0         0         0       2.5          1         0
   18             0         0         0         0       2.5          1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                    User  t-series Engl Metr ***
                                    in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
```

```
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                      3.061     COPY   501     12
PERLND  11                      3.061     COPY   501     13
PERLND  15                      0.283     COPY   501     12
PERLND  15                      0.283     COPY   501     13
PERLND  18                      0.283     COPY   501     12
PERLND  18                      0.283     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                     in  out                                ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1
```

```
  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><--------> ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.333          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.333          IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   Vault.wdm
MESSU      25   MitVault.MES
           27   MitVault.L61
           28   MitVault.L62
           30   POCVault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      18
      PERLND      13
      PERLND      14
      PERLND      15
      IMPLND       2
      IMPLND       4
      IMPLND       5
      IMPLND       8
      RCHRES       1
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   18     C, Lawn, Steep          1    1    1    1   27    0
   13     C, Pasture, Flat        1    1    1    1   27    0
   14     C, Pasture, Mod         1    1    1    1   27    0
   15     C, Pasture, Steep       1    1    1    1   27    0
  END GEN-INFO
```

```
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   18         0    0    1    0    0    0    0    0    0    0    0    0
   13         0    0    1    0    0    0    0    0    0    0    0    0
   14         0    0    1    0    0    0    0    0    0    0    0    0
   15         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   18         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   13         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   14         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   15         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   18         0    0    0    0    0    0    0    0    0    0    0
   13         0    0    0    0    0    0    0    0    0    0    0
   14         0    0    0    0    0    0    0    0    0    0    0
   15         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   18              0       4.5      0.03       400      0.15       0.5     0.996
   13              0       4.5      0.06       400      0.05       0.5     0.996
   14              0       4.5      0.06       400       0.1       0.5     0.996
   15              0       4.5      0.06       400      0.15       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   18              0         0         2         2         0         0         0
   13              0         0         2         2         0         0         0
   14              0         0         2         2         0         0         0
   15              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   18            0.1      0.15      0.25         6       0.3      0.25
   13           0.15       0.4       0.3         6       0.5       0.4
   14           0.15       0.4       0.3         6       0.5       0.4
   15           0.15      0.25       0.3         6       0.3       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS      GWVS
   18              0         0         0         0       2.5          1         0
   13              0         0         0         0       2.5          1         0
   14              0         0         0         0       2.5          1         0
   15              0         0         0         0       2.5          1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
```

```
    # -  #                     User  t-series Engl Metr ***
                                    in  out           ***
    2      ROADS/MOD              1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    ***
    2         0    0    1    0    0    0
    4         0    0    1    0    0    0
    5         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL     *********
    2         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
    5         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    0
    4         0    0    0    0    0
    5         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2           400      0.05       0.1      0.08
    4           400      0.01       0.1       0.1
    5           400      0.01       0.1       0.1
    8           400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
    4              0         0
    5              0         0
    8              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
    4              0         0
    5              0         0
    8              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
RD In***
PERLND  18                      0.283     RCHRES   1      2
```

```
PERLND  18                      0.283     RCHRES   1      3
PERLND  13                      0.185     RCHRES   1      2
PERLND  13                      0.185     RCHRES   1      3
PERLND  14                      0.729     RCHRES   1      2
PERLND  14                      0.729     RCHRES   1      3
PERLND  15                      0.351     RCHRES   1      2
PERLND  15                      0.351     RCHRES   1      3
IMPLND   2                      0.772     RCHRES   1      5
IMPLND   4                      0.714     RCHRES   1      5
IMPLND   5                      0.124     RCHRES   1      5
IMPLND   8                      0.069     RCHRES   1      5
Bypass***
PERLND  14                      0.087     COPY   501     12
PERLND  14                      0.087     COPY   601     12
PERLND  14                      0.087     COPY   501     13
PERLND  14                      0.087     COPY   601     13
IMPLND   2                      0.266     COPY   501     15
IMPLND   2                      0.266     COPY   601     15
IMPLND   4                      0.032     COPY   501     15
IMPLND   4                      0.032     COPY   601     15
IMPLND   5                      0.013     COPY   501     15
IMPLND   5                      0.013     COPY   601     15

******Routing******
PERLND  18                      0.283     COPY     1     12
PERLND  13                      0.185     COPY     1     12
PERLND  14                      0.729     COPY     1     12
PERLND  15                      0.351     COPY     1     12
IMPLND   2                      0.772     COPY     1     15
IMPLND   4                      0.714     COPY     1     15
IMPLND   5                      0.124     COPY     1     15
IMPLND   8                      0.069     COPY     1     15
PERLND  18                      0.283     COPY     1     13
PERLND  13                      0.185     COPY     1     13
PERLND  14                      0.729     COPY     1     13
PERLND  15                      0.351     COPY     1     13
RCHRES   1                          1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                        in  out                             ***
    1     Vault  1                1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
    1       0  1  0  0    4  0  0  0  0       0  0  0  0  0         2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1             0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.064486  0.000000  0.000000
  0.177778  0.064486  0.011464  0.016919
  0.355556  0.064486  0.022928  0.023927
  0.533333  0.064486  0.034392  0.029304
  0.711111  0.064486  0.045857  0.033837
  0.888889  0.064486  0.057321  0.037831
  1.066667  0.064486  0.068785  0.041442
  1.244444  0.064486  0.080249  0.044762
  1.422222  0.064486  0.091713  0.047853
  1.600000  0.064486  0.103177  0.050756
  1.777778  0.064486  0.114641  0.053501
  1.955556  0.064486  0.126105  0.056113
  2.133333  0.064486  0.137570  0.058608
  2.311111  0.064486  0.149034  0.061001
  2.488889  0.064486  0.160498  0.063304
  2.666667  0.064486  0.171962  0.065525
  2.844444  0.064486  0.183426  0.067674
  3.022222  0.064486  0.194890  0.069757
  3.200000  0.064486  0.206354  0.071780
  3.377778  0.064486  0.217819  0.073746
  3.555556  0.064486  0.229283  0.075662
  3.733333  0.064486  0.240747  0.077531
  3.911111  0.064486  0.252211  0.079355
  4.088889  0.064486  0.263675  0.081139
  4.266667  0.064486  0.275139  0.082884
  4.444444  0.064486  0.286603  0.084593
  4.622222  0.064486  0.298068  0.086268
  4.800000  0.064486  0.309532  0.087912
  4.977778  0.064486  0.320996  0.089525
  5.155556  0.064486  0.332460  0.091109
  5.333333  0.064486  0.343924  0.092667
  5.511111  0.064486  0.355388  0.094199
  5.688889  0.064486  0.366852  0.095706
  5.866667  0.064486  0.378316  0.097190
  6.044444  0.064486  0.389781  0.098652
  6.222222  0.064486  0.401245  0.100092
  6.400000  0.064486  0.412709  0.101512
  6.577778  0.064486  0.424173  0.102912
  6.755556  0.064486  0.435637  0.104293
  6.933333  0.064486  0.447101  0.105657
```

```
  7.111111  0.064486  0.458565  0.107003
  7.288889  0.064486  0.470030  0.108332
  7.466667  0.064486  0.481494  0.109645
  7.644444  0.064486  0.492958  0.110943
  7.822222  0.064486  0.504422  0.112225
  8.000000  0.064486  0.515886  0.113493
  8.177778  0.064486  0.527350  0.114748
  8.355556  0.064486  0.538814  0.115988
  8.533333  0.064486  0.550279  0.117216
  8.711111  0.064486  0.561743  0.118430
  8.888889  0.064486  0.573207  0.119633
  9.066667  0.064486  0.584671  0.120823
  9.244444  0.064486  0.596135  0.122002
  9.422222  0.064486  0.607599  0.123169
  9.600000  0.064486  0.619063  0.124326
  9.777778  0.064486  0.630527  0.125472
  9.955556  0.064486  0.641992  0.126607
  10.13333  0.064486  0.653456  0.127733
  10.31111  0.064486  0.664920  0.128848
  10.48889  0.064486  0.676384  0.129954
  10.66667  0.064486  0.687848  0.131051
  10.84444  0.064486  0.699312  0.132139
  11.02222  0.064486  0.710776  0.133217
  11.20000  0.064486  0.722241  0.134287
  11.37778  0.064486  0.733705  0.135349
  11.55556  0.064486  0.745169  0.136402
  11.73333  0.064486  0.756633  0.137447
  11.91111  0.064486  0.768097  0.138485
  12.08889  0.064486  0.779561  0.139514
  12.26667  0.064486  0.791025  0.140537
  12.44444  0.064486  0.802490  0.141551
  12.62222  0.064486  0.813954  0.169431
  12.80000  0.064486  0.825418  0.201153
  12.97778  0.064486  0.836882  0.221442
  13.15556  0.064486  0.848346  0.237772
  13.33333  0.064486  0.859810  0.251885
  13.51111  0.064486  0.871274  0.264526
  13.68889  0.064486  0.882738  0.276099
  13.86667  0.064486  0.894203  0.286850
  14.04444  0.064486  0.905667  0.296942
  14.22222  0.064486  0.917131  0.306490
  14.40000  0.064486  0.928595  0.315581
  14.57778  0.064486  0.940059  0.324278
  14.75556  0.064486  0.951523  0.332633
  14.93333  0.064486  0.962987  0.340685
  15.11111  0.064486  0.974452  0.936274
  15.28889  0.064486  0.985916  2.730734
  15.46667  0.064486  0.997380  4.689359
  15.64444  0.064486  1.008844  6.019875
  15.82222  0.064486  1.020308  6.803336
  16.00000  0.064486  1.031772  7.470836
  16.17778  0.064486  1.043236  8.081624
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.333          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.333          IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
```

```
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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FIGURE 10
BACKWATER BASIN MAP

To be prepared at time of Engineering submittal.

APPENDIX C
CONSTRUCTION STORMWATER POLUTIONS PREVENTION PLAN (CSWPPP)

To be prepared at time of Engineering submittal.

APPENDIX D
SPECIAL REPORTS AND STUDIES

1. Proposed Mine Hill Road Driveway Evaluation – Transportation Engineering NorthWest, Dated March 9, 2018
2. Mine Hill Traffic Assessment by Transportation Engineering Northwest, Dated August 26, 2019
3. Geotechnical Engineering Study by Icicle Creek Engineers Inc. Dated June 08, 2016. Revised September 16, 2019
4. Critical Area Study, Wetlands and Streams by Aquatica Environmental Consulting, LLC Dated October 23, 2018
5. Conceptual Mitigation Plan by Aquatica Environmental Consulting, LLC, Dated September 2019
6. Preliminary Coal Mine Hazard Assessment by Icicle Creek Engineers, Inc. Dated July 7, 2015
7. Arborist Report by Creative Landscape Solutions, Dated September 11, 2019

APPENDIX E
DOWNSTREAM MAP AND PHOTOS

(TDA 1, NDA 1)

Looking northeast at the northeast 42” diameter culvert conveying Mine Hill Creek in a northeasterly direction.

42” discharge point into Issaquah Creek.

(TDA 1, NDA 2)

The existing type 2 catch basin with birdcage which is the collection point of NDA 2.

(TDA1, NDA 3)

Type 1 catch basin which is the collection point of NDA 3. This catch basin is located within Mine Hill Apartments parking lot.

(TDA1, NDA 4)

The collection point for NDA 4. Runoff exists the project Site as sheet flow and is collected by this Type 1 catch basin in Mine Hill Apartments access road.

APPENDIX F
OPERATIONS AND MAINTENANCE MANUAL

To be prepared at time of Engineering submittal.

APPENDIX G
ENGINEER'S ESTIMATE

To be prepared at time of Engineering submittal.